

WHAT IS CLAIMED IS:

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~~1. An image display apparatus comprising image display means for displaying a parallax image, a display optical system for guiding light from the image display means to a position of an exit pupil, exit pupil control means for spatially and temporally dividing the exit pupil into a plurality of areas and controlling a passing beam to each area, and image switching control means for controlling switching between parallax images of the image display means in correspondence to passing beams through the respective areas of the exit pupil, wherein a plurality of parallax images are perceived by a single eye of an observer.~~

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2. An image display apparatus comprising image display means for displaying a parallax image, a display optical system for guiding light from the image display means to a position of an exit pupil, and exit pupil control means for controlling a position or a size of the exit pupil in a direction perpendicular to the optical axis, dividing the exit pupil into a plurality of areas, and successively generating the plurality of divided areas of the exit pupil without duplication, wherein the image display means successively displays corresponding parallax images according to beams passing the respective areas thus

3. The image display apparatus according to Claim 1 or 2, wherein said exit pupil has a diameter two to five times larger than a diameter of the pupil of the observer using said image display apparatus.

4. The image display apparatus according to Claim 1 or 2, wherein any one of the plurality of areas in said exit pupil has a size not more than half a size of the pupil of the observer using said image display apparatus.

5. The image display apparatus according to Claim 1 or 2, said image display apparatus being mounted on the head of the observer, wherein said exit pupil is fixed at the position of the pupil of the observer.

6. The image display apparatus according to Claim 1 or 2, wherein said exit pupil is divided into a plurality of areas only in the horizontal direction.

7. The image display apparatus according to Claim 1 or 2, wherein said image display means comprises a transmissive spatial light modulator and said exit pupil control means comprises a self-emissive spatial light modulator.

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Claim 11, wherein said dividing aperture has a diameter two to five times larger than a diameter of the pupil of the observer using said image display apparatus.

5 13. The image display apparatus according to Claim 11, wherein any one of the plurality of apertures in said dividing aperture has a size not more than half a size of the pupil of the observer using said image display apparatus.

10 14. The image display apparatus according to Claim 11, said image display apparatus being mounted on the head of the observer, wherein said dividing aperture is fixed at the position of the pupil of the
15 observer.

15 15. The image display apparatus according to Claim 11, wherein said dividing aperture is divided into a plurality of apertures only in the horizontal
20 direction.

25 16. The image display apparatus according to Claim 11, wherein said image display means comprises a transmissive spatial light modulator and said dividing aperture comprises a self-emissive spatial light modulator.

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17. The image display apparatus according to
Claim 11, wherein said image display means comprises a
self-emissive spatial light modulator and said dividing
aperture comprises a transmissive spatial light
5 modulator.

18. The image display apparatus according to
Claim 11, wherein each of said image display means and
said split aperture comprises a transmissive spatial
10 light modulator.

19. An image input apparatus comprising imaging
means for imaging an object, an imaging optical system
for guiding light from the object to the imaging means,
15 aperture generating means for spatially and temporally
dividing a pupil of the imaging optical system into a
plurality of areas and controlling a passing beam to
each area, and control means for controlling switching
between parallax images taken by the imaging means in
20 correspondence to the respective areas of the pupil so
as to effect input of the parallax images.

20. An image input apparatus comprising imaging
means for imaging object information, an imaging
25 optical system for guiding light from an object to the
imaging means, aperture generating means for
controlling a position or a size of a pupil of the

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imaging optical system, dividing the pupil into a plurality of areas, and limiting a beam-passing area, and control means for making the imaging means successively take corresponding parallax images according to positions of the aperture of the pupil.

21. The image input apparatus according to Claim 19 or 20, wherein said pupil is divided into a plurality of areas only in the horizontal direction.

22. The image input apparatus according to Claim 19 or 20, wherein said aperture generating means comprises a transmissive spatial light modulator.

23. A stereoscopic display system comprising the image display apparatus of Claim 1, 2, or 11, and the image input apparatus of Claim 19 or 20.

24. A stereoscopic display system comprising imaging means for imaging an object, an imaging optical system for guiding light from the object to the imaging means, aperture generating means for spatially and temporally dividing a pupil of the imaging optical system into a plurality of areas and controlling a passing beam to each area, control means for controlling switching between parallax images taken by the imaging means in correspondence to the respective

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areas of the pupil so as to effect input of the
parallax images, image display means for displaying a
parallax image, a display optical system for guiding
light from the image display means to a position of an
5 exit pupil, exit pupil control means for spatially and
temporally dividing the exit pupil into a plurality of
areas and controlling a passing beam to each area, and
image switching control means for controlling switching
of the parallax images taken by the imaging means, to
10 the parallax images on the image display means in
correspondence to passing beams through the respective
areas, wherein a plurality of parallax images are
perceived by a single eye of an observer.

25. The stereoscopic display system according to
Claim 23, wherein a position and a size of the pupil of
said imaging optical system are approximately equal to
those of said exit pupil.

26. An image display apparatus wherein an optical
system comprising image information generating means
for displaying a parallax image and a display optical
system for guiding light from the image information
generating means to a pupil of an observer is moved to
25 scan in front of the pupil of the observer by scanning
means whereby a plurality of parallax images are
perceived by a single eye of the observer.

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27. The image display apparatus according to Claim 26, wherein said display optical system sets a diameter of an exit pupil thereof smaller than a diameter of the pupil of the observer.

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28. The image display apparatus according to Claim 26 or 27, wherein said scanning means moves said optical system to scan across the pupil in front of the pupil of the observer.

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29. The image display apparatus according to Claim 28, wherein said optical system is moved to scan only in the horizontal direction.

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30. The image display apparatus according to Claim 28, wherein said optical system is moved to scan in the horizontal direction and in the vertical direction.

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31. The image display apparatus according to Claim 26 or 27, wherein one cycle of scanning effected by said scanning means is within time of persistence of vision for the observer.

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32. The image display apparatus according to Claim 26 or 27, wherein said image information generating means displays different parallax images

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corresponding to said scan.

33. The image display apparatus according to Claim 26 or 27, said image display apparatus being
5 mounted on the head of the observer, wherein said exit pupil is fixed so as to be matched with the position of the pupil of the observer.

34. An image display apparatus comprising image
10 display means capable of displaying image information with parallax, illumination means having an illumination light source for illuminating the image display means, and a display optical system for guiding
15 light from the image display means to an observing eye, in which the illumination light source is located at or near a position optically equivalent to an entrance pupil of the display optical system and in which the image information is observed while a position of an exit pupil of the display optical system is
20 approximately matched with a position of an entrance pupil of the observing eye, wherein the illumination light source comprises a plurality of unit light sources, wherein images of the unit light sources spatially divide the exit pupil of the display optical
25 system into a plurality of illumination areas, and wherein a plurality of parallax images are made incident in time series into a single eye of an

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observer by making use of control means for time-
divisionally controlling radiation of light from the
plurality of unit light sources so as to control time
division of the exit pupil of the display optical
5 system into the plurality of illumination areas and for
controlling switching between image information
displayed on the image display means in correspondence
to circumstances of incidence of light to the
respective illumination areas.

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35. An image display apparatus comprising a
plurality of image display means capable of displaying
image information with parallax, at least one
illumination means having an illumination light source
15 for illuminating the plurality of image display means,
and a display optical system for guiding light from the
plurality of image display means to an observing eye,
in which the illumination light source is located at or
near a position optically equivalent to an entrance
20 pupil of the display optical system and in which a
position of an exit pupil of the display optical system
is approximately matched with a position of an entrance
pupil of the observing eye so as to permit observation
of the image information, wherein the illumination
25 light source comprises a plurality of unit light
sources, wherein images of the unit light sources
spatially divide the exit pupil of the display optical

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system into a plurality of illumination areas, and wherein a plurality of parallax images are made incident simultaneously or time-serially into a single eye of an observer by making use of control means for
5 controlling parallax images displayed on the plurality of image display means in correspondence to radiation of light from the plurality of unit light sources.

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36. The image display apparatus according to
10 Claim 35, comprising a plurality of said illumination means, wherein said control means time-divisionally controls radiation of light from the plurality of unit light sources in the illumination light source of each illumination means, thereby time-divisionally
15 controlling incidence of light to the plurality of illumination areas in the exit pupil of the display optical system, and wherein said control means controls switching between parallax images displayed on the plurality of image display means in correspondence to
20 incidence of light to the plurality of illumination areas.

37. The image display apparatus according to Claim 34, 35, or 36, wherein a horizontal size of the
25 exit pupil of said display optical system is not more than 30 mm.

38. The image display apparatus according to either one of Claims 34 to 36, wherein the plurality of unit light sources of said illumination light source are comprised of a light emitter array.

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39. The image display apparatus according to either one of Claims 34 to 36, wherein the plurality of unit light sources of said illumination light source are comprised of a surface illuminant and a transmissive spatial light modulator.

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40. The image display apparatus according to either one of Claims 34 to 36, wherein the plurality of unit light sources of said illumination light source are comprised of a surface illuminant and a reflective spatial light modulator.

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41. The image display apparatus according to either one of Claims 34 to 36, wherein said image display means comprises a transmissive spatial light modulator.

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42. The image display apparatus according to either one of Claims 34 to 36, wherein said image display means comprises a reflective spatial light modulator.

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43. The image display apparatus according to
either one of Claims 34 to 36, wherein said display
optical system has a prism body comprising a
decentered, rotationally asymmetric, reflecting surface
5 with optical powers differing depending upon azimuthal
angles.

44. An image display system wherein a pair of the
image observation apparatus as set forth in either one
10 of Claims 34 to 36 are provided for the left and right
eyes of the observer.

45. The image display apparatus according to
Claim 28, wherein one cycle of scanning effected by
15 said scanning means is within time of persistence of
vision for the observer.

46. The image display apparatus according to
Claim 28, wherein said image information generating
20 means displays different parallax images corresponding
to said scan.

47. The image display apparatus according to
Claim 28, said image display apparatus being mounted on
25 the head of the observer, wherein said exit pupil is
fixed so as to be matched with the position of the
pupil of the observer.

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